

XII. *Some bionomic notes on Butterflies from the Victoria Nyanza.* By S. A. NEAVE, M.A., B.Sc., F.E.S., Magdalen College, Oxford.

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PLATES IX—XII.

THE following notes on the bionomics of African butterflies mainly refer to the large collection recently sent to the Hope Department, Oxford University Museum, by Mr. C. A. Wiggins, M.R.C.S., F.E.S., etc., etc. This magnificent collection, with excellent data, has already been described in *Nov. Zool.* vol. xi, pp. 323–363, 1904.

A further large and important collection from the same region, made by Mr. A. H. Harrison, has also been made use of to some extent. Where numbers are given, they generally refer to Mr. Wiggins' collection only.

The district whence these specimens come proves itself to be of peculiar interest to students of geographical distribution. It is here that we have a great commingling of Eastern and Western forms. In the list of specimens in the paper above referred to will be found records of such species as *Elymnias phegea*, Fabr., *Bicyclus iccius*, Hew., many species of *Planema*, *Euxanthe crossleyi*, *Charaxes zingha*, Cram., to mention only a few, all of which until a few years ago were thought to be species confined to the tropical West Coast of Africa. These are mingled among many truly East African forms.

As will be seen later, *A. niavius* and *dominicanus*, originally described as distinct species and subsequently considered distinct forms, are now shown to form a syngamic group. This extension of the Western fauna to E. Central Africa is most probably due to the extension eastward of dense forest land, similar to that on or near the western tropical coast. The climate on or near the equator has apparently much less defined wet and dry seasons, resulting in a humid atmosphere and equable temperature more suitable to the growth of dense vegetation.

This absence of well-defined wet and dry seasons has a marked effect on the seasonal forms in the Lepidoptera of the country, well-marked seasonal characters being relatively scarce. In studying the mimetic groups in such a large

number of specimens there are to be found many points of interest. We can hardly fail to notice that nearly every species which exists in large numbers (and has therefore been successful in the struggle for existence) almost invariably forms the model for other species, or itself exhibits Müllerian mimicry with other abundant and distasteful species. In some cases it is true a few models, viz. certain species of *Planema*, were only taken in very small numbers, but when we see that their mimics (spp. of *Pseudacraea*) were also equally scarce, it is allowable to suppose that either owing to their retiring habits or some other such cause these species were overlooked, or that the collection was made near the edge only of their area of distribution.

Association of Amauris echeria jacksoni, Sharpe, and *A. albimaculata*, Butler, with *A. psyttalea* f. *damoelides*, Staud.

On examining a large series of both *Amauris echeria* and *A. albimaculata*, which, as Messrs. Rothschild and Jordan* have recently pointed out, are clearly distinct species, I was much struck with the difference between the Victoria Nyanza specimens and those from Southern Africa.

The *echeria* specimens have long since been described by Miss Sharpe as *A. jacksoni*,† a distinct species, but are doubtless not more than a geographical race of *A. echeria*.

The *albimaculata* specimens are extremely like, if not identical with *A. hanningtoni* of Butler,‡ which is also only a form of *albimaculata*. I shall endeavour to show that both these forms differ from typical South African ones in a common direction, and that these differences are due to the presence of *A. psyttalea*, bringing all three species into a clearly marked synaposematic group.

The Uganda specimens of both species, more especially the ♀♀, bear a marked general resemblance to *A. psyttalea damoelides*, Staud. The chief character by which this resemblance is obtained seems to be the markedly greater average size and roundness of the spot within the discoidal cell of the fore wing. I have therefore measured both the length and breadth of this spot in a number of specimens from South Africa, East Africa, and Uganda.

The results are appended in the following table:—

* Nov. Zool. x, p. 504. † P. Z. S. 1891, p. 633.

‡ P. Z. S. 1888, p. 91.

No. of specimens measured.	Discocellular spot average.		No. of specimens measured.	Discocellular spot average.	
	Length.	Breadth.		Length.	Breadth.
<i>S. Africa (S. of the Limpopo).</i>					
<i>A. echeria</i> , Stoll.	12	2.26 mm.	<i>A. albimaculata</i> , Butler.	22	2.13 mm. 1.02 mm.
<i>B. E. Africa (E. of the Rift Valley).</i>					
<i>A. echeria jacksoni</i> , Sharpe.	3	3.73 mm.	<i>A. albimaculata</i> , f. intermediate to <i>hanningtoni</i> , Butler.	5	3.32 mm. 1.52 mm.
<i>E. and N.E. of the Victoria Nyanza.</i>					
<i>A. echeria jacksoni</i> , Sharpe.	85	4.049 mm.	<i>A. albimaculata</i> <i>hanningtoni</i> , Butler.	30	3.860 mm. 1.756 mm.
<i>W. and N.W. of the Victoria Nyanza.</i>					
<i>A. echeria jacksoni</i> , Sharpe.	23	3.947 mm.	<i>A. albimaculata</i> <i>hanningtoni</i> , Butler.	38	3.953 mm. 2.232 mm.

It is therefore fairly safe to say, even considering the comparatively small number of specimens measured, that there has been a marked increase in the size of this spot as we advance northward along the East Coast, and thence turn westward to the apparent limit of the area of distribution of the species. In addition to this increase in area of the spot, which is common to both species, it is fairly evident from the above table that there is an increase of a peculiar kind, the spot becoming distinctly more circular in shape as we proceed westward. As will be seen from the table, the ratio of breadth to length is appreciably greater in *both* species west of the Lake than east of it. In *A. albimaculata* this progressive increase occurs as we come up from the south, as well as from east to west.

Other points of superficial resemblance which both species share, are greater expanse of wings and much better development of submarginal spotting on the hind wing. As might be expected, the resemblance in the ♀♀ is markedly closer than in the ♂♂. The ♀ specimen of *albimaculata* from Toro, figured, shows this resemblance in an astonishing manner, and has the additional characteristic of the pale buff area at the base of the hind wing being somewhat diffused. This resemblance becomes all the more significant when we remember that *A. psyttalea* does not occur in South Africa, while it is a very dominant species in Uganda, and also occurs, but not so commonly, in British East Africa. I have not had an opportunity of comparing numbers of specimens of *A. psyttalea* from the east and west shores of the Lake, but it is undoubtedly very common, and occurs in the Wiggins collection from every locality except the more open plains.

This clear influence that the presence of one species has had upon two other closely allied ones (all being highly distasteful), seems to be one of the most striking examples of Müllerian mimicry that it is possible to imagine.

The specimens of *A. psyttalea* are themselves remarkably interesting, the species being apparently in rather an unstable condition. The majority of the specimens, especially from the more eastern localities, are of the form *damoclidus*, Staud., but a number from the north-west of the Lake are typical *A. psyttalea*, Plotz, from the tropical Atlantic Coast. These specimens, which are accompanied by many intermediates, are distinguished from *A. psyttalea*

damocles by a reduced pale area at the base of, and the absence of submarginal spots on the hind wing, giving them a marked general resemblance to western forms such as *A. damocles*, Beauv. (non Fabr.), and *hecate*, Butler. *A. hecate* does itself occur sparingly on the shores of the Lake; as also another species allied to it, viz., the recently-described *A. disa*, mihi (2).* In this species all the white markings and (especially the pale area at the base of the hind wings) are even more reduced than in *hecate*.

The above is a striking case of a species acting as a model, at one and the same time as certain individuals of it are being attracted into another group. This complicated condition of mimetic association in which a species is both model and mimic at the same time is well known to be paralleled in the Neotropical region, where we find similar but still more complicated instances among the *Danainæ*, *Heliconinæ* and *Ithomiinæ*.

The specimens of *Amauris niavius*, Linn., are also deeply interesting. Whilst the specimens taken west and north-west of the Lake (with one exception from Entebbe which is intermediate in character) are all *A. niavius niavius*, the typical western forms, those from the north-eastern shores numbering about thirty specimens are nearly fifty per cent. of them intermediate to *A. niavius dominicanus*, which occurs at Mombasa.

The two chief points of distinction in the latter form are the greater extent of all the white areas and spots on both wings. The spot within the cell and subapical bar of the fore wing, together with the white basal area of the hind wing, are especially larger. In *A. niavius niavius* the discocellular spot is evanescent, and the white basal area of the hind wing seldom even reaches the extremity of the cell.

The specimens above mentioned occurring from the east of the Lake are remarkably intermediate in respect of these characters. The discocellular spot is well marked but not so large as in *dominicanus*. The subapical white bar is broader than in *niavius*, but not so broad as in *dominicanus*. The basal white area of the hind wing extends well beyond the extremity of the cell, but not nearly so far as it does in *dominicanus*.

The two instances above of two geographical forms of a species meeting and appearing in an intermediate form on

* *Loc. cit.* p. 324.

the confluent edges of their distribution is of remarkable interest.* It should help to impress upon systematists the importance of carefully considering the question of geographical races of species before making new species on slight differences.

MIMETIC GROUPS WITH DANAINÉ MODELS.

The black and white *Amauris niavius*, Linn., forms the model for an important group of butterflies of many families. It is evidently very abundant on the shores of the Lake. There are 118 specimens in the Wiggins Collection.

The group comprises:—

Euralia anthedon, Doub. et Hew. (14).

Hypolimnas montecironis, Druce (4 ♂♂, 3 ♀♀), of which the ♀ only is mimetic.

Papilio dardanus ♀, f. *hippocoon*, Fabr. (8), mostly from the eastern side of the Lake. The ♂♂ of *dardanus* (46) were common nearly everywhere.

Elymnias bammakoo, Westw. (7), all from the Western districts.

In all these forms the resemblance to the model is remarkably good, the distribution of white markings on a black or dusty ground faithfully follows those of the model and differs in much the same way from the South and East African mimics (*H. wahlbergi*, *P. cenea*, *hippocoonoides*, etc.) of *A. niavius dominicanus* as the two models do from each other.

The ♀♀ of *Planema godmani*, Butler (2), with the recently described *Pseudacræa tirikensis*, mihi (3), resembling it in an astonishing manner, form a subsidiary black and white group within the larger assembly having *niavius* as its model. This is, perhaps, especially the case when the insects are on the wing. At rest the *Planema*, and the *Pseudacræa* closely following its model, present the character so common in the larger Ethiopian *Acræinæ* of a black-spotted chocolate-brown triangle at the base of the hind wing on the under surface. The influence of this character on other forms and of other forms on it has

* Professor Poulton has already called attention to the case of *A. niavius* in his Presidential Address to the Entomological Society 1904. Trans. Ent. Soc. 1903, p. xciv.

already been considered by Professor Poulton.* He points out the great influence which the *Papilios* of the *zenobia* group have had in respect of this character.

It is interesting to note that this group of *Papilios* is well represented in the collection, comprising the following species :—

<i>P. homeyeri</i> , Plotz.	. . .	39 specimens.
<i>P. cynorta</i> , Fabr.	. . .	8 „
<i>P. peculiaris</i> , Neave	. . .	1 „
<i>P. zenobia</i> , Fabr.	. . .	49 „
<i>P. gallienus</i> , f. <i>whitnalli</i> , Neave		6 „

As Professor Poulton has pointed out, *loc. cit.* p. 489, in *P. gallienus* and its allies, the basal patch is very large and is traversed by black lines instead of spots, a character not occurring in *Planema*. In the other species the area is smaller and the lines replaced by spots. This condition reaches its extreme in *P. peculiaris*, mihi ♀, which, as will shortly be shown, is an extraordinarily close mimic of *Planema paragea*, Grose-Smith. *P. homeyeri* is also remarkable for the fact that the colour of this patch is more chocolate-brown in colour instead of golden-brown as in other species. In this respect it approaches *P. godmani* and *P. tirikensis* mentioned above.

Neptis agatha, Stoll (47), and its allies may also be not improbably members of this group. This species exhibits in common with other species of the Ethiopian region a concentration of the white markings on both wings, as Professor Poulton has already pointed out, † in contrast to the broken character of these markings in Oriental species. The flight of these species is also singularly slow and floating when undisturbed and much like that species of *Planema* and black and white *Amauris*.

The variable *A. psyttalca*, Plotz (81), from many localities was accompanied by its equally variable mimic *Hypolimnias dubius*, Pal. (9), in the more western localities.

AMAUROS ECHERIA GROUP.

Owing to their extremely close resemblance, *A. echeria jacksoni*, Sharpe, and *A. albimaculata hanningtoni*, Butler,

* Trans. Ent. Soc. 1902, p. 488,

† *Loc. cit.* p. 467.

may be conveniently taken as the same model. They both seem common in nearly every locality except the more exposed and open plains. There were 176 specimens from various localities in the two collections, but Mr. Wiggins speaks of them as his "pet aversion," explaining that they were enormously abundant. The best mimics of these species in the collection are:—

Euralia mima, Trim. (16), mostly from the west shore of the Lake.

Papilio homeyeri, Plotz, 36 ♂♂ and 3 ♀♀, of which the latter only are mimetic.

Papilio dardannus ♀, f. *cenca*, Stoll.

This form of the ♀ did not occur in the Wiggins collection, but there are three specimens in the Harrison coll. from Nyangori, near the north-east shore of the Lake.

As Professor Poulton has pointed out, *loc. cit.* p. 485, there is a very remarkable secondary resemblance between these mimics. The ♀ of *P. homeyeri*, which does not occur in the group mentioned by him, further bears this out, having an actually closer resemblance to *Euralia mima* than to *Amauris echeria* itself. There are also in the collection some other less good mimics of *A. echeria* lying on the outskirts of the group, comprising:—*Hypolimnas dinarcha*, Hew., the forms of *Pseudacraa lucretia*, and a number of the smaller *Acræas* such as *A. servona*, Godm., *A. circeis*, Dewitz, *A. oreas*, Sharpe, and its form *albimaculata*, and especially *A. johnstoni*, f. *flavescens*. *Neptis woodwardi*, Sharpe, also comes into the same group.

For a full account of the convergence between many species of *Acræa*, including most of the above-mentioned, and species of *Amauris*, see Professor Poulton's paper, read before Section D of the British Association at Toronto, 1897.*

LIMNAS CHRYSIPPUS GROUP.

Limnas chrysippus, L. (342) and *Hypolimnas misippus*, L. (160), were abundant in every locality. They were somewhat less numerous in forest districts.

Acræa encedon, L. (442), was also very common everywhere.

* Rep. Brit. Assoc. 1897, pp. 688–91.

Table of forms of above species.

<i>L. chrysippus chrysippus</i> 136.	<i>H. misippus</i> ♀ <i>misippus</i> . 55.	<i>A. encedon</i> , f. <i>encedon</i> 164
" " <i>alcippoides</i> 16. }	" " ♀ <i>alcippoides</i> 7. " " <i>alcippina</i> 8	" " <i>lycia</i> . . 126
" " <i>alcippus</i> . 18. }		
" " <i>dorippus</i> 163.	" " ♀ <i>inaria</i> . . 36.	" " <i>daiva</i> . . 124
" " <i>albinus</i> 13.	" " ♀ <i>dorippoides</i> 6.	

It is evident from the above numbers that Mr. Wiggins did not think it worth while to send many ♂♂ of *misippus*. Consequently the true proportion of the occurrence of this species is not obtainable. Two specimens of a new *Acræa*, both ♀♀ (*A. wigginsii*, mihi), exhibit a remarkable synaposematic resemblance to *A. encedon* and indirectly to *L. chrysippus*. The species is allied to and intermediate in many respects between *A. bomba*, Grose-Smith, and *A. anacreontica*, Grose-Smith. It differs from both these species in possessing a subapical white bar. This being probably a mimetic and not an ancestral character it is possible that the ♂♂, not yet known, may not have it.

TIRUMALA PETIVERANA GROUP.

The black and green *Tirumala limniace petiverana*, Dbl. and Hew. (67), an abundant species, was taken in five different localities.

Of its mimic *Papilio leonidas*, Fabr., eight specimens were collected. Also two specimens of *Euxanthe crossleyi ansorgei*, R. and J., which is probably an outlying member of the group.

Melinda formosa, Godm., and *M. mercedonia*, Karsch, with the mimetic *Papilio rex*, Oberth. (hitherto considered the mimic of the Danaine), occur in both collections and are of considerable interest. Their distribution is as follows—

	N.E. SHORE.	N.W. SHORE.
<i>M. formosa</i> . . .	50 specimens . . .	—
<i>M. mercedonia</i> . . .	5 " . . .	36 specimens.

Nyangori, a few miles north-east of the Lake shore, is apparently the eastern boundary of *M. mercedonia*, and from this locality come all the five specimens recorded above. West and north-west of the Lake *mercedonia* is

common, and *formosa* does not seem to occur. There is, strange to say, not a single ♀ amongst all the specimens of *mercedonia* and only four of *formosa*.

The specimens of *Papilio rex*, eight ♂♂ and two ♀♀, in the Wiggins and Harrison collections all come from Nyangori, and are very remarkable. Only two ♂♂ are fairly typical *rex*; the other specimens especially the ♀♀ are markedly intermediate between *P. rex* and *P. mimeticus*, Rothsch. The latter species, it will be remembered, bears a strong resemblance to *M. mercedonia*. The intermediate characters are shown in the reduction in size of the spots, and in the extension of red-brown colour over the hind wings.

This fact becomes of great importance when we recollect that normal specimens of *P. rex* occur on the Kikuyu escarpment to the east, while the only specimen of *mimeticus* at present known comes from Msaromsaro north-west of the Lake. It is therefore of very great interest that, at the place where both species of *Danaines* do occur the *Papilio* should be intermediate in appearance between them; further, that where *mercedonia* exists apparently alone to the west of the Lake the *mimeticus* form should only be found; to the east, where *formosa* only occurs, *rex* should be the only form. All three species were captured at the same time of the year.

Müllerian Association of Danaines and Papilios.

In studying the last two groups one cannot fail to be struck with the fact that the mimicry has not all been on the side of the *Papilios*.

In the first place the widely distributed *Tirumala petiverana*, Dbl. and Hew., may safely be regarded as the ancestral form of the three Danaine members of the group. It extends nearly all over tropical Africa in the more wooded districts, and can only be considered a geographical race of *T. limniace*, so common in the Oriental region. Ethiopian specimens are of interest in exhibiting amongst other differences a distinct shade of reddish-brown on the under-side toward the base of the fore wing. *Melinda mercedonia*, Karsch., and *M. formosa*, Godm., on the other hand, are specialized forms with a comparatively small and local distribution. In addition to their striking red and reddish-brown colour, they differ

from *T. petiverana* in the greater length of the fore wings and in the possession of pale sulphur-yellow areas at the base of the hind wings only interrupted by dark crossing nervures. *M. formosa neumanni*, Rothsch., from Abyssinia is of great interest, and differs in several significant particulars from typical *formosa*.

These differential characters are—

- (a) Slightly shorter fore wings.
- (β) The presence of a V-shaped mark of pale yellow between the median nervure and first median nervure near their junction.
- (γ) The brown colour of the fore wing is darker and less extensive.

This latter characteristic has already been pointed out by Mr. Walter Rothschild, Nov. Zool. 1902, p. 596.

The above characters are also of great interest in that they *all* of them show affinities to *T. limniace*. β is especially characteristic of that species.

Having therefore inquired somewhat into the ancestry of *M. mercedonia* and *formosa* it will be seen that their elongated fore wings and pale areas at the base of their hind wings are new developments and non-ancestral characters. These two points however are characteristic features not only of *Papilio rex* (in which they are specially marked) but of several other African "Swallow-tails," including *P. leonidas* itself, the mimic of *T. petiverana*.

There can be little doubt therefore that the above-mentioned characters of these Danaines have been obtained from the *Papilio*. As regards the brown colour of both *Papilio* and Danaine, on the other hand, the Danaine has almost certainly been the model. In this matter we must remember that red or reddish-brown is very rare in African *Papilios*. It occurs in the *trophonius* ♀ form of *P. cenea* and *P. ridleyanus*, White, both mimetic; also to a less extent in the golden-brown triangle at the base of the hind wing in the *zenobia* group of *Papilios* mentioned above. In Danaines, on the other hand, this colour is by no means uncommon, e.g. *Limnas*, *Salatura* and the allied genus *Anosia*. Further, as we have already seen, *T. petiverana* (the probable ancestor of the two Danaines in question) exhibits a tendency to brownness as compared with its Oriental allies. It is also a significant fact that

this brown colour is more marked in the ♀ of *P. rex* than in the ♂. The Danaines again have most probably formed the model for the spotting of the *Papilios*, which is not quite like that of any of its allies. Considering these facts we may cite the above group as a complete example of diaposematic resemblance.

GROUPS WITH ACRÆINE MODELS.

The fine *Planema poggei*, Dewitz, occurred in fair numbers in both collections, about 20 specimens from several localities. This very striking species with its brilliant orange band on the fore wing has several interesting mimics.

First and perhaps most important of these is the *planemoides* ♀ form of *Papilio dardanus*, Brown, recently described by Mr. Roland Trimen, F.R.S.,* from a single specimen collected by Mr. Hobley of Kisumu. There are six of these ♀♀ in the collections of Messrs. Wiggins and Harrison. Amongst these is a considerable variation in the extent and completeness of the orange band on the fore wing. One specimen is remarkable for showing an intermediate character to the ♀ form of *cenea dardanus*, and the orange colour, though present, is much broken up into spots, and the basal area of the hind wing is buff coloured as in the *cenea* form instead of white as in typical *planemoides*.

Other interesting mimics of *P. poggei* in the collection are:—*Pseudacræa hobleyi* Neave, (2), in which the resemblance is best in the ♀ but remarkably close in both sexes. *Pseudacræa kuenowi neumanni*, Thur. 2. *Acræa aurivillii*, Staud. (14), synaposematic with *poggei*. *Elymnias phegea*, Fabr. (2) (also referred to by Mr. Trimen *loc. cit.*).

An outlying member of this group was recognized in the 3 ♀♀ of *Precis rauana*, Grose-Smith, which bear an orange bar across the fore wing as in the ♂♂ (14); but have a *white* discal bar instead of an orange one to the hind wing. This gives them the same general appearance as the above forms.

Planema tellus, Auriv. (9), from the western districts, is resembled by the recently described *Pseudacræa terra, nihi* (1), also from the western side of the Lake, the resemblance being astonishingly close.

* Trans. Ent. Soc. Lond. 1903, pt. I, p. xl.

All the members of a small group of peculiar interest were captured by Mr. Wiggins at Entebbe on the north-west shore of the Lake within a few days of each other.

The dull-coloured *Planema paragea*, Grose-Smith, 1 ♂ (April 5, 1903) and 1 ♀ (April 9, 1903) is the model of the group. It is mimicked by two species both recently described,* viz.:—

Pseudacraea obscura, 1 ♂, 1 ♀ (April 5, 1903), of which the ♀ is the better mimic.

Papilio gallicus peculiaris, † 1 ♀ (April 6, 1903).

This species is remarkable for its small size and sombre colour relieved by pale cream-coloured markings, thus closely resembling the model.

Remarkable evidence of the coincidence of mimetic forms in time and space is here afforded by the fact that three such widely-separated species, all very closely resembling one another, should all have been captured on the same spot and on nearly the same date.

The plentiful *Acræa sotikensis*, Sharpe (37), has only one mimic in the collection but that a remarkable one, viz. *Mimaeræa poultoni*, mihi (3). The resemblance on both surfaces is extremely close. The group of spots on the underside at the base of the hind wing and the characteristically marked hind margin of the *Acræa* is faithfully represented on the Lycaenid.

A very large number of small orange-red and black *Acræas*, forming a synaposematic group occur in the collection comprising:—

- Acræa vinidia*, Hew. (1287).
- „ *alicia*, Sharpe (147).
- „ *uvui*, Grose-Smith (5).

And the more outlying *A. serena*, Fabr. (1451).

They are mimicked by the Lycaenid *Telipma carnuta*, Hew. (2).

A similar group is that in which the common *Pardopsis*

* *loc. cit.* pp. 333 and 342.

† N.B.—Dr. Karl Jordan, of the Tring Museum, informs me that this species may not improbably prove to be a mimetic form of the ♀ of *cymorta*, Fabr., the ♂♂ (not represented in the Wiggins coll.) being hardly distinguishable from that species.

punctatissima, Boisd. (150), is the model. Two species of Lycænidae are associated with it, viz. :—

Pentila pectra, Hew. (24).
 „ *clarensis*, Neave (10).

NOTE.—Prof. Poulton informs me that he discovered two specimens of *P. amenaida*, Hew., placed among the *Acræas* in the Hope Collection by Professor Westwood.

Another synaposematic group among the *Acræinæ* consists of the larger red and black species, viz. :—

A. egina, Cram. (21).
A. perenna, Dbl. and Hew. (42).
A. zetes, Linn. (7).
A. pharsalus, Ward (8).
A. orina f. *orinata*, Oberth. (6).

These species belong to no less than three different subdivisions of the *Acræinæ*.

These species—especially *A. egina*—are resembled closely by *Papilio ridleyanus*, White (4).

Pseudacræa boisduvali, Dbl., though not in the Wiggins or Harrison collection, was obtained by Mr. A. W. Hobley in the same district, and also closely mimics *A. egina*.

Monura zingha, Cram. (1), is probably an outlying member of this red and black group.

It is by no means improbable that the outlying gigantic mimic, *Papilio antimachus*, Drury, will also ultimately be found here.

MIMICRY IN OTHER GROUPS.

Atella phalantha (144), so common all over Africa, occurs plentifully in the collection, together with its mimic, *Pseudargynnis hegemonæ*, Godt. (35), from many of the same localities. As is so often the case, the resemblance is closer in the ♀ than in the ♂.

Mimicry among the Pierinæ.

Three very differently coloured species of *Mylothris* form the models of three well-marked groups.

1. *Mylothris jacksoni*, E. M. Sharpe, with white fore wings and sulphur-yellow hind wings, is only represented by a

single specimen in the Wiggins collection, but it appears to be common in other collections from the same area.

It is mimicked by :—

A yellow hind-winged ♀ form of *Belenois zochalia*, f. *formosa*, Butler, of which there are three specimens. Of the ordinary form of the ♀ there are 2, and 44 ♂♂.

Phrissura lasti, Grose-Smith (1).

Phrissura phæbe, Butler, (2), in which the resemblance is on the upper surface alone.

II. *Mylothris agathina* (139), a very common species, is white with blackish marginal spots on the upperside, while beneath, the apex of fore wings and whole of hind wings are ochreous; furthermore the base of underside fore wing is largely, and that of hind wing slightly, diffused with orange-red.

These characters on both surfaces are faithfully imitated by :—

Belenois thysa, Hopff. (14).

Pinacopteryx rubrocostalis, Lanz. (14).

Phrissura phæbe (2), mimics *M. agathina* on the under surface only, thus entering Group II. as well as I.

III. *Mylothris yulii*, Butler (25), and *Mylothris poppea*, Cram. (40), form a synaposematic pair, both being silvery-white with black marginal markings and both having the base of the fore-wing underside flushed with ochreous.

They are closely mimicked by :—

Phrissura sylvia, Fabr. (17).

Pinacopteryx diceyi, Neave (12).

The latter species is only represented in the collections from the Toro country on the eastern slopes of the Ruwenzori Mts., some distance west of the Lake. The other species occur both east and west of the Lake.

The extremely abundant yellow and black *Terias*—

T. brigitta, Cram. (89)

T. desjardinsi, f. *regularis*, Boisd. (45)

T. senegalensis (70)

are closely mimicked by the Lycænid, *Teriomima xantha*, Grose-Smith (4).

Seasonal Forms.

Pressure of time, owing to my sudden departure to N.E. Rhodesia in January 1904, prevented me from studying the seasonal forms in this collection as much as I should have wished. They seem to be mainly of interest in the following particular. Just as on the equator the seasons are not nearly so well marked as in South Africa, so the seasonal forms are not so well marked, while intermediates are more common.

The most interesting specimens are several fine dry season *Precis caelestina*, Dewitz, and some remarkable intermediate and dry specimens of *P. archesia*, Godt.

In conclusion, I should like to express my unbounded gratitude to Professor Poulton, D.Sc., F.R.S., of the Hope Department, Oxford University Museum, at whose suggestion the work was undertaken, and who has given me the inestimable benefit of his unique knowledge of these subjects.

EXPLANATION OF PLATES.

PLATE IX.

- FIG. 1. *Amauris hecate*, Butler, ♂. From Toro, Western Uganda.
- 1a. *Amauris psyttalea psyttalea*, Plotz, ♂. From Toro. Exhibiting a great general resemblance to Fig. 1 by reason of the reduction of pale basal area and submarginal spots on the hind wing as compared with Fig. 3.
2. *Amauris psyttalea damocliides*, Staud., ♂.
3. " " " " " " " " ♀.
From the N.E. shore of the Lake.
- 2a. *Amauris albimaculata hanningtoni*, Butler, ♂.
- 3a. " " " " " " " " ♀.
From Toro. Exhibiting a great resemblance to the foregoing by reason of the large spot in the discoidal cell of the fore wing, and in the marked submarginal spotting of the hind wing.
4. *Amauris albimaculata albimaculata*, Butler, ♂.
5. " " " " " " " " ♀.
From Malvern, near Durban, S.A. Exhibiting a strong contrast to the preceding Uganda specimens.
- 2b. *Amauris echeria jacksoni*, Sharpe, ♂.
- 3b. " " " " " " " " ♀.
From Entebbe on the W. shore of the Lake. Remarkable for large size and well-marked spot in the discoidal cell as compared with the next species.
6. *Amauris echeria echeria*, Stoll, ♂.
7. " " " " " " " " ♀.
♂ from Malvern near Durban, S.A. ♀ from Durban.

PLATE X.

- FIG. 1. *Planema poggei*, Dewitz, ♂. From N.E. of the Lake. Remarkable for its brilliant orange discal bar on the fore wing, and white bar on the hind wing.
2. *Acræa aurivillii*, Staud., ♂. Synaposematic with the above. From N.W. shore of the Lake.
3. *Pseudacræa knenowi neumanni*, Thur., ♂. From N.W. shore of the Lake. Bears a marvellous resemblance on both surfaces to Fig. 1.
4. *Pseudacræa hobleyi*, Neave, ♂. From Entebbe, N.W. shore of the Lake.
5. *Precis rauana*, Grose-Smith, ♂.
6. " " " " " " " " ♀.
♂ from N.E., ♀ from N.W. shore of the Lake. The ♀ only is mimetic.
7. *Elymnias bammakoo*, Westw., ♂. From N.W. shore of the Lake.
8. *Papilio dardanus* ♀ f. *planemoides*, Trim. This magnificent form, with its orange discal bar to the fore wing and white basal area to the hind wing, bears a very close resemblance to the model.

PLATE XI.

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- FIG. 1. *Melinda formosa*, Godm., ♂.
 1a. " " " " ♀.
 ♂ from Kikuyu escarpment. ♀ from N.E. shore of the
 Lake.
2. *Papilio rex*, Oberth., ♂.
 2a. " " " " ♀.
 From the Kikuyu escarpment.

PLATE XII.

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- FIG. 3. *Papilio rex*, f. intermediate to ♂ *mimeticus*, Rothsch.
 3a. " " " " " ♀ " "
 From N.E. shore of the Lake. From this locality both the
 Danaines, *M. formosa* and *M. mercedonia*, occur.
4. *Melinda mercedonia*, Karsch., ♂.
 From the N.W. shore of the Lake.
5. *Papilio mimeticus*, Rothsch., ♀.
 From the N.W. shore of the Lake.